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Dynamical studies in condensed matters on High Resolution Chopper Spectrometer (HRC) –2nd phase of HRC project –

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The High Resolution Chopper Spectrometer (HRC) at MLF J-PARC delivers relatively high-energy neutrons with high resolutions for a wide range of dynamical studies in condensed matters, and we proposed the three types of inelastic neutron scattering (INS) experiments: high-resolution experiments in a conventional energy momentum space, neutron Brillouin scattering (NBS), and sub-eV neutron spectroscopy. In the 1st phase of our project (FY2008 - FY2013), we constructed the HRC and confirmed its basic performance. Based on the achievement, in order to realize a practical use of NBS and to demonstrate INS under external fields, we planned to improve the performance of the HRC in the 2nd phase (FY2014 - FY2019): improvement of low angle experiments, development of Fermi choppers for higher resolution, improvement of sample environments, and improvement of computational environment [1,2]. As the result, we successfully obtained scientific achievements for both purposes. First, we investigated spin waves in metallic ferromagnet SrRuO3 in the relation to Weyl fermion by means of NBS, and showed that the Berry curvature is an observable of INS [3]. Second, we investigated spin dynamics in frustrated magnet CsFeCl3 with noncolinear spin structure under high pressure, and found a new hybridization of the Nambu-Goldstone mode and Higgs mode near quantum critical point [4]. Furthermore, we have successfully investigated spin dynamics in condensed matters with a conventional manner of INS [5-9].

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